

Myocardial Revascularization (I)

**Coronary Revascularization. State of the Art**

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**EPIDEMIOLOGICAL ASPECTS**

Ischemic heart disease is the major cause of death in developed countries. Current data from Spain suggest that over the past years there has been an increase in the prevalence of ischemic heart disease.<sup>1</sup> Although a significant decrease in mortality due to this condition has also been demonstrated in the Spanish population, this is neither general nor uniform, and there are wide geographical areas in which the mortality rate is not decreasing.<sup>2</sup>

One of the most exciting therapeutic options for the management of ischemic heart disease is coronary revascularization. Over the past decade, we have witnessed a number of unprecedented advances in the alternatives and the results obtained with different revascularization strategies. These advances have led to a Copernican revolution in the approach and management of patients with coronary heart disease. Not very long ago, it was necessary to justify meticulously the need to perform coronary angiography, and the need for revascularization even more so. A critical clinical evaluation continues to be essential in the decision-making process involving these techniques. However, at the present time, it is more likely to have to justify the opposite: why a study of the coronary anatomy was not indicated in a patient with symptoms (at times, with the diagnosis alone) of ischemic heart disease, to complete the prognostic evaluation and, above all, to assess the candidacy of the patient for the benefits of revascularization.

In Spain, there is considerable variability in the utilization of invasive diagnostic techniques; likewise,

such variability also refers to the use of the various coronary revascularization strategies, either in patients with stable angina or in those presenting acute coronary syndromes, with or without ST-segment elevation.<sup>3-5</sup> In fact, it is in the utilization of these two types of health care assets that one of the wider variations (depending on the type of hospital and the geographical region) in the management of ischemic heart disease patients is observed.<sup>3-5</sup>

Currently available evidence tends to favor the initial utilization of an invasive strategy in the majority of patients with acute coronary syndromes.<sup>6</sup> In this respect, the longstanding controversy concerning a more or less restricted use of this therapeutic approach appears to be of less importance.<sup>7,8</sup> The superiority of primary angioplasty over fibrinolysis has been clearly demonstrated in patients with ST-segment elevation acute myocardial infarction.<sup>9</sup> Moreover, recent controlled studies in these patients support the philosophy of attempting to achieve adequate coronary revascularization after successful thrombolytic therapy,<sup>10</sup> and have also clearly established the true utility of rescue angioplasty when thrombolysis proves ineffective.<sup>11</sup> Similarly, the benefit of this strategy, the purpose of which is to provide early coronary revascularization, has also been demonstrated in large subgroups of patients with non ST-segment elevation acute coronary syndromes.<sup>6</sup> Thus, the limitation to a more widespread use of coronary revascularization in these patients is more a question of unavailability, logistics and cost.

**THE EVOLUTION OF REVASCULARIZATION STRATEGIES**

In the developed world, interventional cardiology has undergone a spectacular evolution. In Spain and other countries with a similar socioeconomic status, the number of interventions has increased exponentially over the past decade.<sup>12,13</sup> For example, in Spain, over a 6-year period, the number of diagnostic coronary angiograms (59 321 in 1998 vs 90 939 in 2003) and of percutaneous coronary interventions (20 146 in 1998 vs 40 584 in 2003) has increased by 100%.<sup>12,13</sup>

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On the other hand, the advent of drug eluting stents has led to an authentic revolution in coronary interventions. Immediately after the presentation of the data from the RAVEL study<sup>14</sup>, we had the pleasure of printing a provocative editorial from this group of investigators entitled “The RAVEL Trial. Zero Percent Restenosis: a Cardiologists Dream Comes True!” in our journal.<sup>15</sup> Although it is now very evident that the restenosis rate is not zero percent in the majority of patients (with certain unfavorable clinical or angiographic features),<sup>16-18</sup> there is no doubt that with the use of these novel devices, we can guarantee a drastic reduction in its incidence. Thus, there are new expectations and we are beginning to question some of the old paradigms in the treatment of patients with severe multivessel disease, and even those with left coronary artery involvement,<sup>19</sup> conditions classically reserved for surgical treatment. In this respect, very recent data suggest, for the first time, that the clinical course of selected patients with multivessel disease treated with drug eluting stents should be comparable to that observed in similar patients who undergo surgical revascularization (Serruys PW, Washington 2004, personal communication). It is yet to be determined how the different health care models will deal with the initial increase in costs associated with the utilization of these new devices.<sup>18</sup>

In turn, coronary surgery remains the most firmly established revascularization strategy which, undoubtedly, has withstood the test of time extremely well. The results of classical randomized studies that compared medical treatment with surgery demonstrated not only its utility in the treatment of the symptoms in ischemic heart disease patients, but its capacity to improve the prognosis of large subgroups of patients with coronary disease. In this respect, it should be pointed out that we have yet to obtain similar data confirming a decrease in mortality among patients who had undergone coronary interventions. Moreover, the complexity and comorbidity of the patients who are currently being treated surgically differ widely from those treated in the eighties. This situation is due to the aging of the population and to the fact that interventional cardiologists tend to select cases in which there is a high probability of percutaneous treatment being successful. Despite all these circumstances, the figures corresponding to coronary surgery in Spain over the past 5 years have remained relatively constant.<sup>20</sup>

However, the type of intervention has changed radically. The need for the systematic attempt to implant arterial grafts, not only in anterior descending artery, but in a growing number of main coronary arteries, as well, is less and less controversial. On the other hand, cardiac surgeons have been capable of incorporating new increasingly sophisticated, complex and laborious techniques that enable them to perform anastomoses in

the beating heart, thus avoiding the deleterious effects of extracorporeal circulation. Important advances have also been made in the direction of minimally invasive surgery and of hybrid approaches involving percutaneous techniques. This new orientation of cardiac surgery aimed at the surgical treatment of more complex patients, employing an increasing number of arterial grafts and much less aggressive techniques, is occurring while excellent results in terms of mortality and morbidity are being maintained.<sup>20-22</sup>

## JUSTIFICATION AND ORIENTATION OF THE UPDATE

The scientific and academic importance of this subject is unquestionable. Over the past 10 years (1995 to 2004), there has been a gradual but clearly progressive increase in the already considerable number of scientific publications on coronary/myocardial revascularization. According to the results of a Medline search, over this period of time, an average of about 3000 articles have been published annually in the world literature, meaning that approximately eight new articles on this subject appear each day. In our journal, the number of articles on revascularization published during the same period has also increased gradually (for an average of 25 articles a year). On the other hand, an update of the Clinical Practice Guidelines for coronary artery surgery of the American College of Cardiology/American Heart Association has been published<sup>23</sup> and the major European guidelines for coronary interventions (to be published soon) have also been presented. In view of this avalanche of information, exhaustive as well as diverse and wide-ranging, it seems logical to make an effort to organize our knowledge with the publication of the present “Update.” Other considerations that have been taken into account in this endeavor were, on the one hand, its eminently practical nature and, on the other, the fact that it affects a very substantial number of patients.

In this series, we have asked experts of recognized prestige to discuss, from an essentially clinical point of view, the current status of myocardial revascularization. First, the different clinical aspects that should be taken into account in decision-making involving these patients will be reviewed. Subsequently, the details of percutaneous coronary interventions will be examined, including their evolution over the course of time, the development and selection of different devices that are currently available, and the implications of clinical and anatomical factors, and of the procedure itself, on outcome. One chapter will be devoted specifically to primary angioplasty in acute myocardial infarction and another to recent advances in adjuvant drug therapy. Still another chapter will summarize the available evidence concerning the utility of drug eluting stents and other devices or strategies to prevent restenosis. This

part of the series will close with a look at the emerging options for percutaneous revascularization. The second large section of this "Update" will focus on coronary surgery. The first chapter will be devoted to a review of the historical evolution, the changes in the indications and results that can be expected in current surgical practice. Subsequently, there will be a chapter that reviews the most relevant aspects of arterial grafts and an additional article will analyze the present indications and results of surgery without extracorporeal circulation and those of minimally invasive techniques. A final chapter will reflect on the future of coronary surgery, discussing the expectations and impending challenges.

After reading this "Update," we should remind ourselves that, within a context of continuing scientific advances, the excellent results that can be achieved with revascularization techniques should not dazzle us to the extent that we lose the overall perspective of the problem:

1. Despite the spectacular results obtained with coronary revascularization, its impact on the population is still very limited, especially if we compare it with the epidemiological benefits associated with the implementation of simple measures for the prevention of cardiovascular risk.

2. The impact of recent pharmacological advances in patients with ischemic heart disease (whether or not they have undergone revascularization) is yet to be defined. For example, recent studies suggest that we can now reduce the progression of coronary atherosclerosis, both in stable and unstable patients, using the proper pharmacological means.<sup>24,25</sup>

3. Finally, in the near future, the precise diagnosis of coronary disease will routinely be reached through noninvasive techniques.<sup>26,27</sup> The clinical and therapeutic implications that this new scenario might have are difficult to predict at the present time.

We hope that this new "Update" on REVISTA ESPAÑOLA DE CARDIOLOGÍA will stimulate the interest of our readers. Above all, we trust in its practical utility, not only for cardiologists who have to make decisions concerning revascularization in patients with ischemic heart disease or those involved in the follow-up of these patients, but for any physician devoted to the treatment of patients with cardiovascular disease.

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